Developments in Nuclear Energy Technologies and Nuclear Data Needs

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The objective of this paper is to identify nuclear systems and technologies currently under development, along with the nuclear data challenges these technologies will raise. The US R&D programs are taken as an example to support our general conclusions.

The nuclear industry has two immediate objectives: run existing plants more efficiently, and where appropriate extend their licenses. In general, current computational methodologies are adequate for these applications, and there is no urgent need for new or improved nuclear data.

A more ambitious objective for current plants might be the increase of the average fuel discharge burnup, maybe up to 100,000MWd/mt. This would require that fuel enrichment be increased beyond the current 5% limit. While new cross sections would probably not be needed, it might become necessary to validate and increase the accuracy of existing data for these new applications. This will involve criticality safety issues and possibly the need to better determine the composition of spent fuel.

Future reactors, such as ALWR's, will first be extrapolations of current design and as long as they are used in a once through mode, will not require new data.

The following generation of reactors, such as the cogeneration Very High Temperature Reactor (VHTR) needs to be seriously reviewed as far as nuclear data and computational methods are concerned: it is not at all clear that the current *ad hoc* approach will be sufficiently rigorous for guaranteeing computational results of very high quality and to minimize margins for design.

Other reactor types, like GCFRs, can introduce the need for improved data related to new materials (e.g. fuel matrices, reflectors etc.)

The most demanding challenges will occur in the following phase, when closure of the fuel cycle occurs, either in thermal or fast reactors, and potentially making use of accelerator driven systems. The paper will first describe the technical and institutional elements that will guide the development and implementation of these technologies. The paper will then summarize for each of these technologies, the major technical uncertainties that need to be solved, including the need for a better formalized nuclear data file with associated covariance matrices.

In general, data needs for the full fuel cycle assessment will play a major role to define guidelines for future requirements in the nuclear data field.

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